Communicating uncertainty: A policy and news media issue

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with ideas from Bob Ryan, Ray Ban, and others

Overview

- Key recommendations in 2006 NRC report: Completing the Forecast
- Role of broadcast community in effectively communicating uncertainty
- Why communicate uncertainty for more effective decision-making?
- How to communicate uncertainty?
  - Ideas and examples

NRC Report: Completing the Forecast

- Sponsored by NOAA/NWS
- Summary of task:

  Provide recommendations to improve estimation and *communication* of uncertainty in weather, hydrological, and short-term climate forecasts
- Committee members from academia, NCAR, media, private sector, user groups

NRC Report: Key findings

- *Uncertainty is a fundamental characteristic of weather prediction*, and no forecast is complete without a description of its uncertainty
- However, for decades, users of forecasts have been conditioned to receive incomplete information about the certainty or likelihood of events
- Not communicating uncertainty can hinder effective decision-making by forecast users in a variety of situations

NRC Report: Key Recommendations

- Recommendation 1: The entire Enterprise should take responsibility for effectively communicating forecast uncertainty information ("Turn the ship")
- Recommendation 3: All sectors of the Enterprise should cooperate in educational initiatives that will improve communication and use of uncertainty information

  The broadcast meteorology community plays a *critical role* in effectively communicating meteorological information with the public and other forecast users, for societal benefit

Why communicate uncertainty?

- *Not communicating uncertainty can lead people to misinterpret forecasts, hindering decision-making → with severe negative impacts*

HIGH 57°
LOW 33°
Partly sunny, wind 8-10
Weather details, A2

The Forum

Classified C4-1
Comics/Crossword B
Diversions B1-
Metro & State C
Obituaries C
Opinion A
Records C
Sports D
Television/Movies A

50 CENTS | THURSDAY, APRIL 24, 1997 | FAREO-MOORHEAD

Flood of '97

Finger-pointing begins in Forks

Mayor says poor forecasting doomed city; weather service says it gave its best effort

"I'm not pointing fingers, but our engineers said (the flooding of the city) would have been preventable."

By Julie Prodis
Associated Press

GRAND FORKS, N.D. – Town officials and flood-ravaged residents complained Wednesday that Grand Forks could have been saved if forecasters had been right about how high the Red River would rise.

"I don't like to be critical, but we were told absolutely 49 feet by the weather service," Mayor Pat Owens said two days after the river crested at more than 54 feet.

"I'm not pointing fingers," she said, "but our engineers said it would have been preventable."

Others say there's little that could have

Service was already predicting record flooding in the Grand Forks area. The previous record was 48.8 feet set in 1979. The February forecast of 49 feet remained the same through the early April blizzard. Not until April 14 was it increased to 50 feet.

Sandbagging had already been going on for weeks. And as the river rose, schools and businesses closed to send their students and employees to the front lines piling bags atop the 49-foot earthen dike.

On April 18th, as the first of the residents along the river began to flee, the weather service increased the crest forecast to 50½ feet. Predictions increased three times over the next two days to 54 feet.

(From R. Pielke, Jr. / NRC 2006)

- *Ineffectively communicating uncertainty can lead people to misinterpret forecasts*

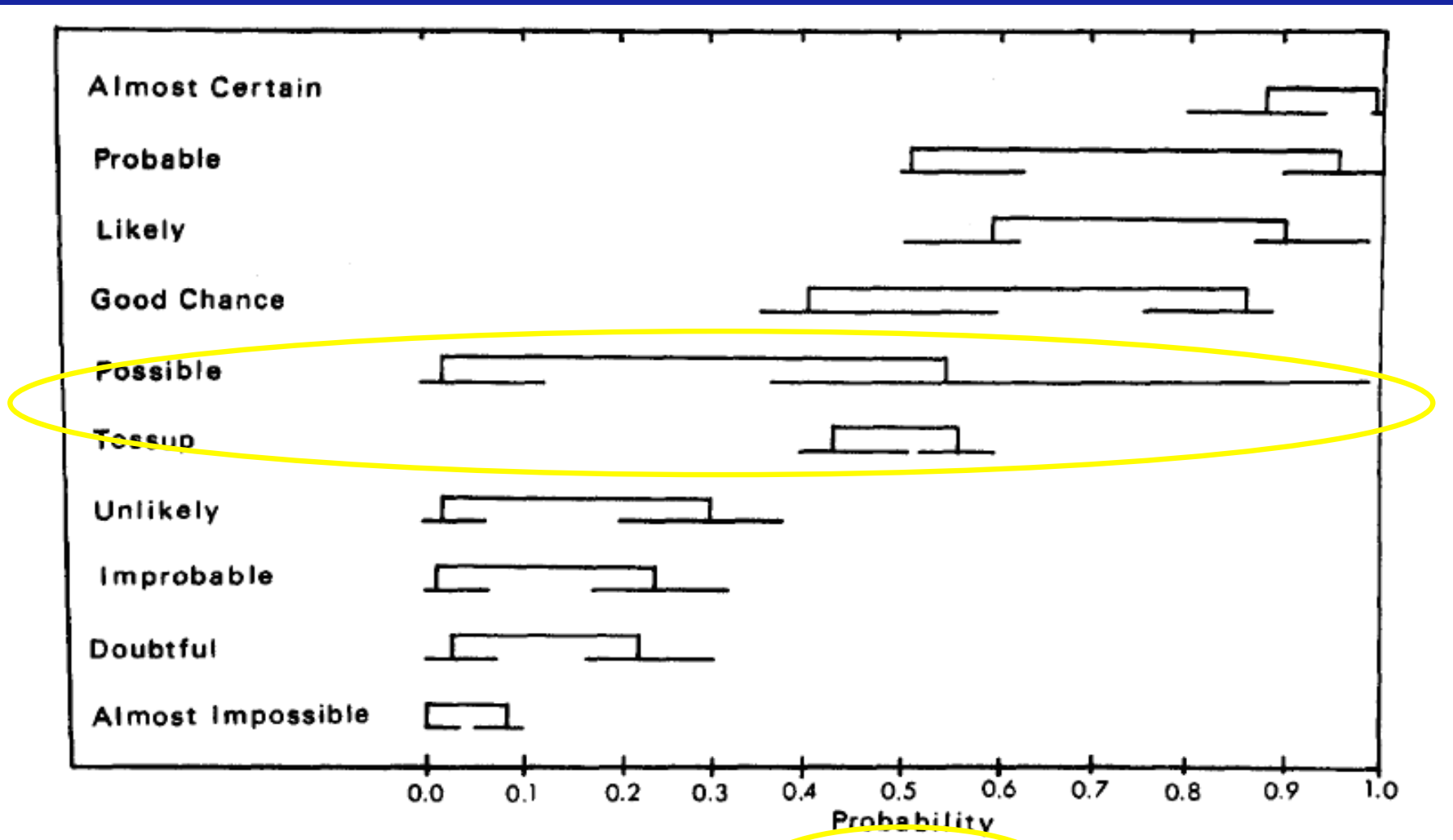


Figure 4. First, second, and third quartiles over subjects of the upper and

(From Wallsten et al. 1986 / NRC 2006)

- *Many members of the public are not afraid of uncertainty information – and even want it!*

With Probability

Without Probability

Would it be useful for you to see the probability of rain or thunderstorms on the StormCenter4 forecast graphic?

Choice	Votes	Percent of 5895 votes
Yes	5710	97%
No	185	3%
Thank you for taking the time to fill out our survey!		

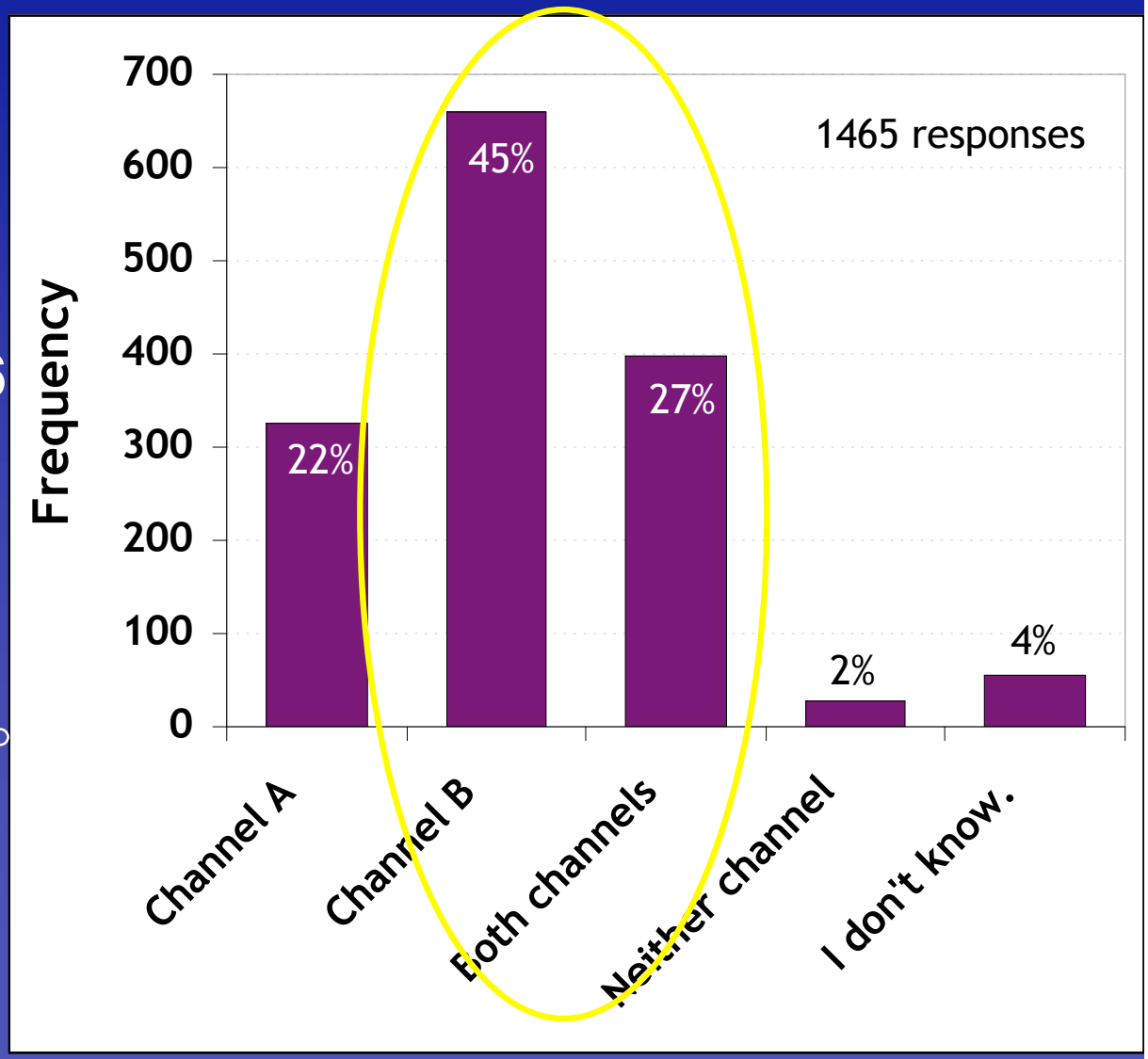
(From B. Ryan / NRC 2006)

- *Many members of the public are not afraid of uncertainty information – and even want it!*

On the evening news:

- Channel A weather forecaster: “The high temperature will be 76 F tomorrow.”
- Channel B weather forecaster: “The high temperature will be between 74°F and 78° F tomorrow.”

Which do you prefer?

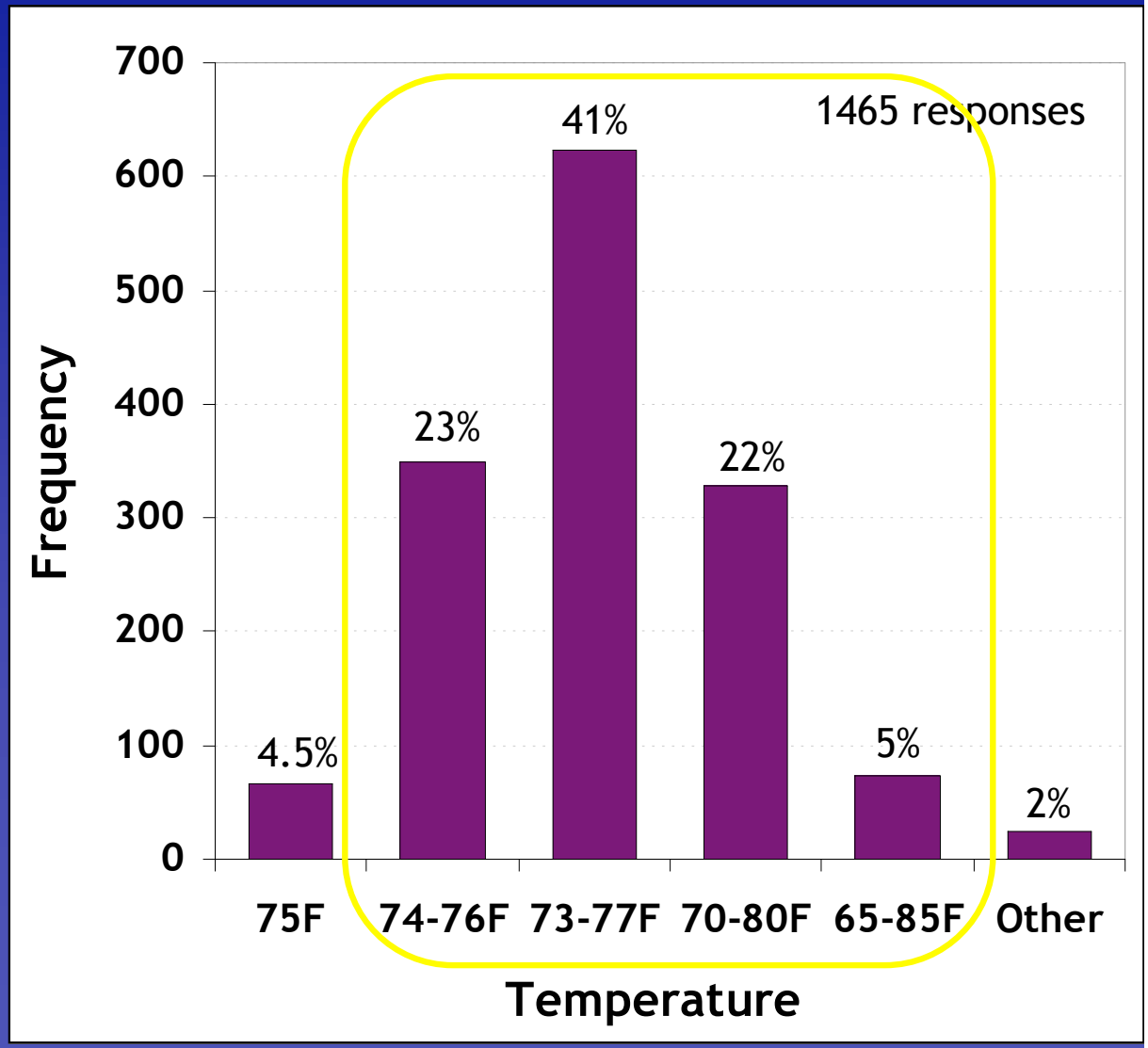


(From Demuth, Lazo, Morss 2007)

- *Most people interpret forecasts as uncertain anyway – and have different interpretations*

Suppose the forecast high temperature for tomorrow for your area is 75°F.

What do you think the actual high temperature will be?



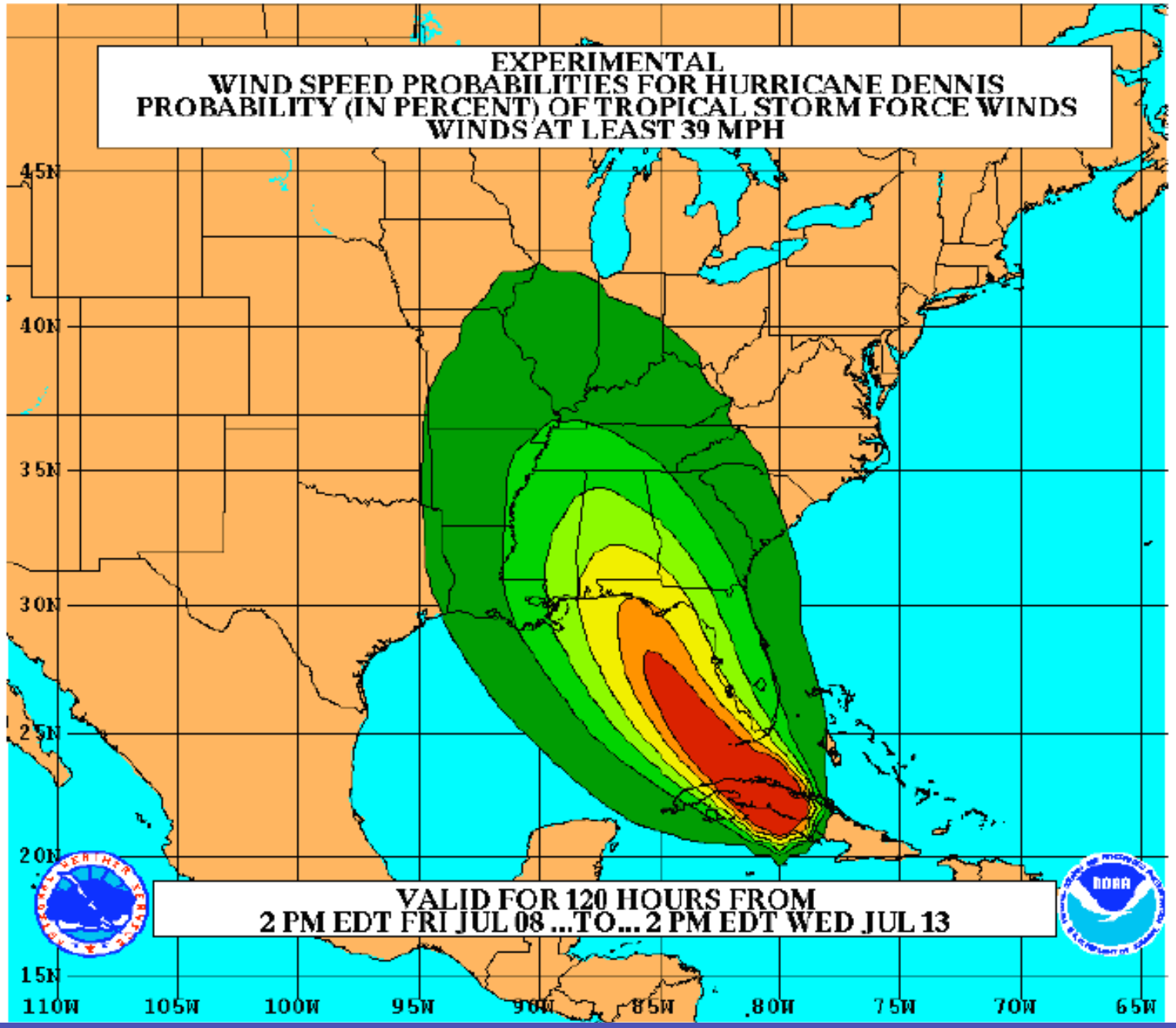
(From Demuth, Lazo, Morss 2007)

As these examples illustrate …

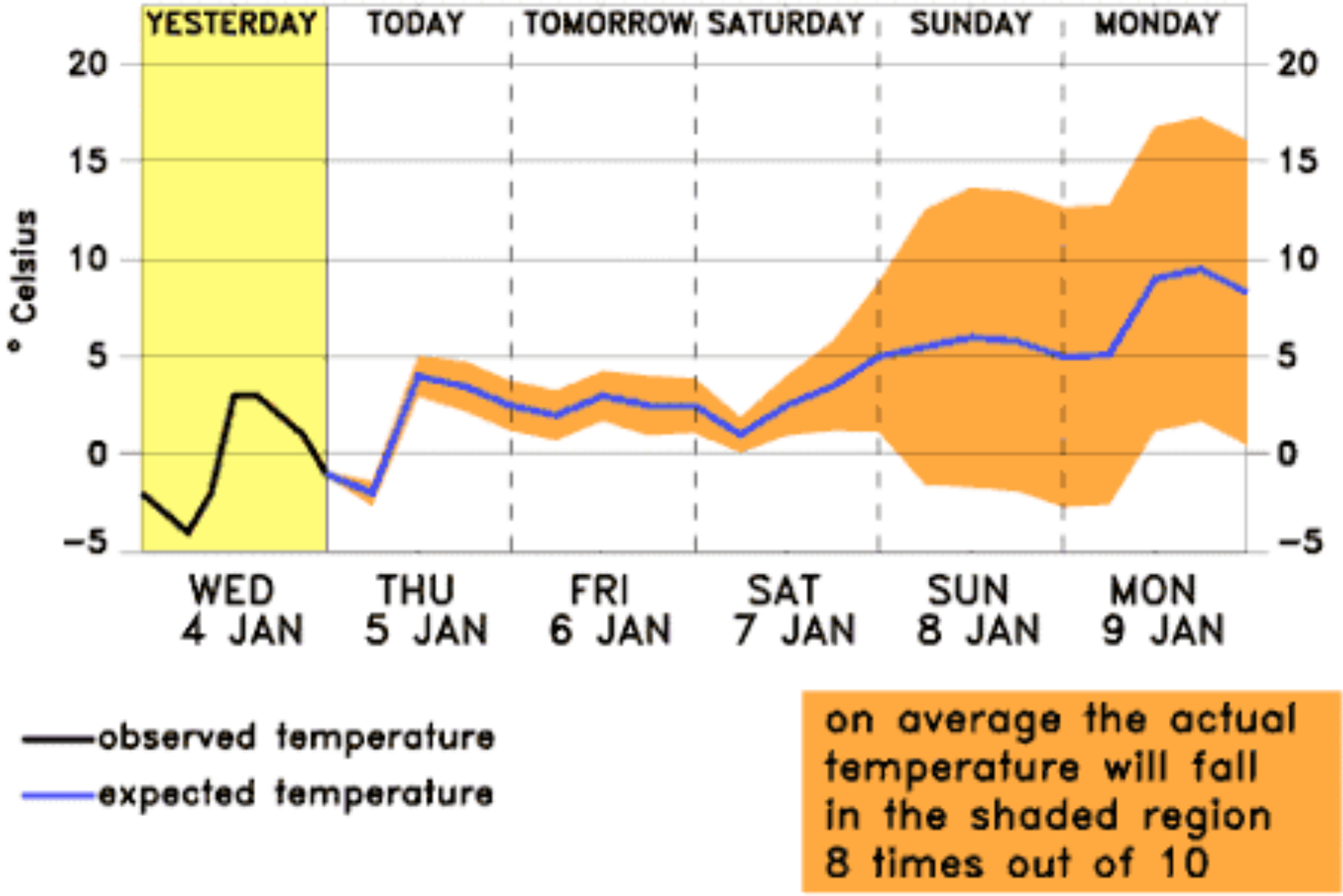
- Communicating forecast uncertainty information to the public is, in many cases, *acceptable*, *wanted*, and *important*

  In fact, many broadcast meteorologists already communicate uncertainty information (usually informally)

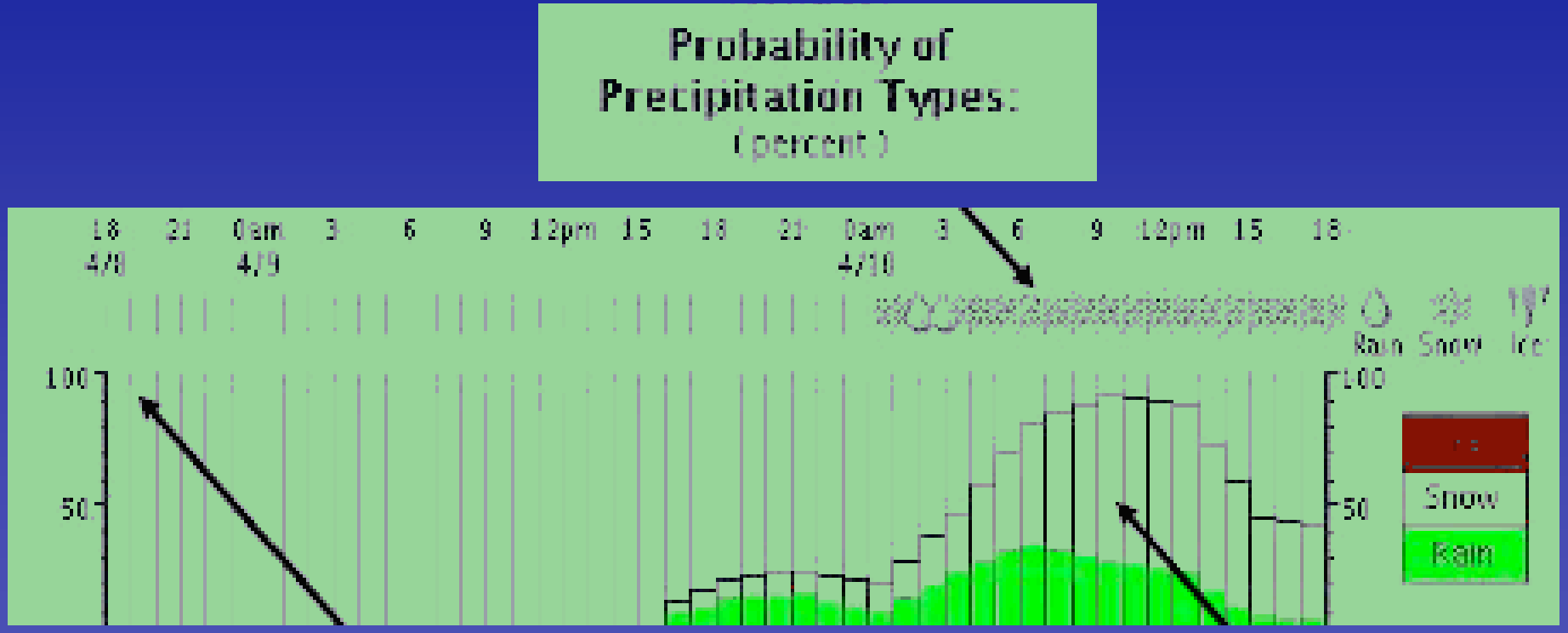
So, how can we communicate forecast uncertainty information more effectively?



(From National Hurricane Center / NRC 2006)

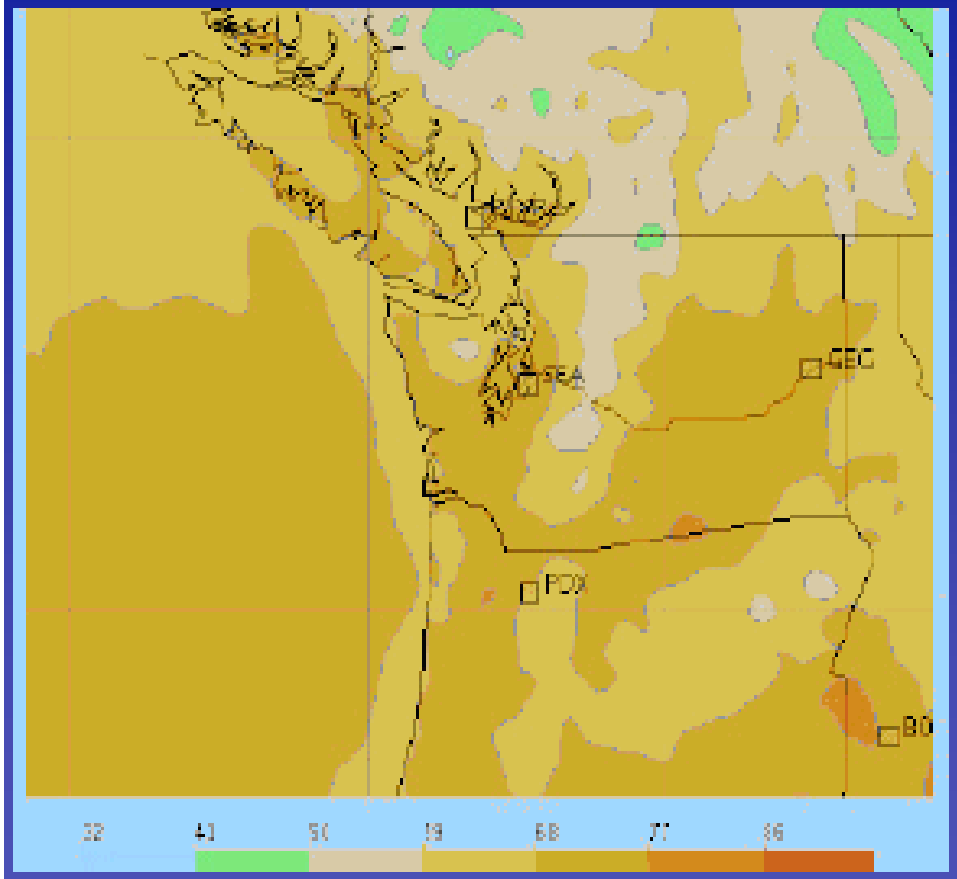


(From M. Roulston / U.K. Met Office)

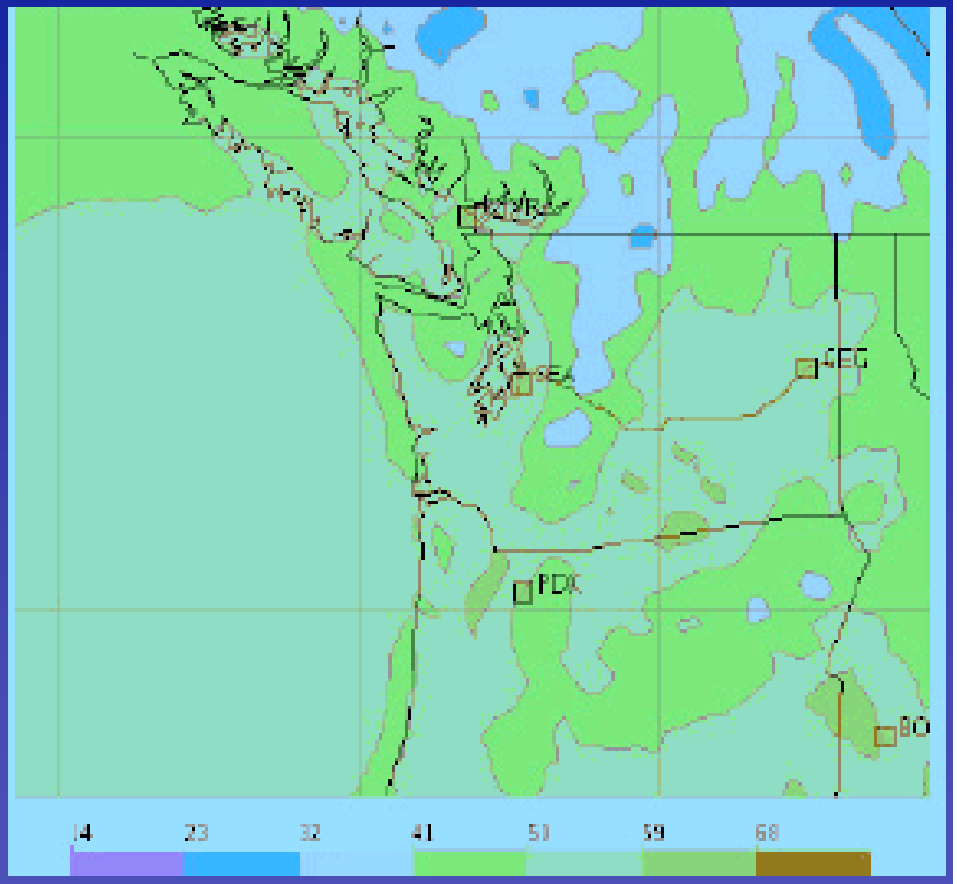


(From Maintenance Decision Support System (FHA/NCAR) / NRC 2006)

48-hour surface temperature forecast



Upper bound (90% exceedance)



Lower bound (10% exceedance)

(From MURI group, Univ. of Washington / NRC 2006)

Summary

- Communicating forecast uncertainty effectively ("Completing the Forecast") is important for effective use of forecasts
- Further research and experimentation is needed to learn how to best communicate uncertainty in different situations
- *For discussion: How can the broadcast community more effectively communicate uncertainty?*